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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 10/521,100 | 01/13/2005 | Yoshifumi Sugito | 264199US0PCT | 7104 |
| 22850 | 7590 | 03/11/2008 | | |
| OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314 | | | EXAMINER FORTUNA, ANA M | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1797 | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/521,100 | Applicant(s) SUGITO ET AL. | |
| | Examiner Ana M. Fortuna | Art Unit 1797 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-12 and 19-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-12 and 19-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/27/07, 5/3/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 19-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 is limited to performing steps 1 and 2 by evaporation and/or reverse osmosis, while claim 20 is directed to performing the first and second steps of claim 20, which depends on claim 19 (and 20), by nanofiltration. Therefore, claim 21 does not further limit claim 20.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 10-11, 19, 22, 23, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 61-0616690 in view of GB 2 234448 A and JP08-276122 or (6,484,887). Reference '690 teaches reverse osmosis and evaporation combination (page 2, left column, lines 8-12). Patent '448 teaches vacuum evaporation and conventional reverse osmosis for desalination of sea water (pages 1-2 and claims). Evaporation and reverse osmosis, and mosaic membranes are well known techniques

of desalinating salt water and/or recovering salts from seawater, as recognized by Applicant's in specification (section background art).

References '690 and '448 fail to suggest the combination of evaporation with mosaic membranes.

Reference '122 **JP'122** also teaches desalting sea water by a charged-mosaic membrane (paragraphs [0002] and [004]).

Futukomi et al ('887) teaches a mosaic membrane and its use as ion selective in the production of common salt by sea water concentration, e.g. desalting of brine, and using the membrane in electrodialysis for desalting sea water (abstract, column 9, last paragraph through column 10, line 24).

As to claim 10, combining evaporation with mosaic membrane is not disclosed by the references above, however, the skilled artisan can predict total salt concentration by evaporation, or reverse osmosis or both, and in combining this unit operations with a membrane that is permeable to common salt (e.g. sodium chloride), such that the mosaic membrane it the separation of monovalent salt (sodium chloride), and the concentration of divalent salts present in sea water or seawater brine can also be predicted by the skilled artisan. Claim 10 further includes a further evaporation of the desalted water produced in the first mosaic membrane, and further desalting of the concentrate to a second mosaic membrane. One skilled in the art at the time this invention was made would have been motivated to evaporate the desalted water, which contains common salt that passes through the mosaic membrane, to recover this salt. Performing more than one treatment step in the concentrate will be cumulative to obtain

a higher common salt recovery. The claim is also limited to different degrees of concentration in each stage. The skilled in this art at the time this invention was made would have been motivated to control the degree of concentration in the evaporation stages to reduce energy cost, since at higher concentration using evaporation higher energy and more costly is the process. The concentration degree by the mosaic membrane does not seem to be critical; the membrane appears to work well in sea water brine (see patent '887, column 9, line 66).

The term "deep ocean water" is considered equivalent to "sea water", because sea water is not limited to water at the surface of the sea or at the bottom, but to all water that comes from the sea.

Claim 11 combines reverse osmosis, evaporation, and mosaic membrane. Combining reverse osmosis and evaporation is disclosed in patent '690. A further combination with mosaic membrane, e.g. to recover common salt from brine, as suggested in patent '887, it would have been obvious to one skilled in this art at the time this invention was made. Reverse osmosis membrane is known to remove all the salts (monovalent and divalent salts) from seawater; evaporation produces desalted water and concentrated salts, which includes mono and divalent salts separated by the reverse osmosis membrane, the skilled artisan wishing to produce monovalent salts, e.g. common salt from the concentrate brine would have been motivated to use mosaic membrane, because they separate monovalent salt, e.g. common salt (sodium chloride), from brine, as disclosed in patent '887, and JP '122.

Claim 19 is directed to combining evaporation or reverse osmosis or both with mosaic membrane, the production of water from sea water by evaporation, reverse osmosis or its combination is known in the art and discussed in reference '690. The combination with mosaic membrane is not disclosed in '690, but suggested by reference '887 and '122. The combination of reverse osmosis and /or evaporation, which remove salts from seawater and produce purified water, with mosaic membrane to treat the concentrated produces predictable results, e.g. the separation of monovalent salts, e.g. common salt (sodium chloride) from the concentrate. The skilled artisan wishing to recover additional water containing common salt would have been motivated to use a mosaic membrane suggested for removing common salt from brine or sea water. As to claims 22 and 23, organic substance and microorganisms and inherently present in seawater. Regarding claims 24-25, the degree of concentration is not clearly disclosed, however, skilled artisan can predict the mosaic membrane performance and the claimed concentrations, because the membrane is taught for treating brine from seawater (see '887).

1. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2001029754 (reference '754) in view of JP 08-276122 or Fukutomi et al (US.6, 84,887), and further in view of Hassan(US 6,508,936).

Reference '754 discloses a process of removing monovalent salts by nanofiltration (abstract, and fig.). JP'754 discloses the use of nanofiltration membranes to desalt salt water (seawater) ([0001]).

Reference '122, and '887 both teach the use of charged mosaic membrane for treating sea water and to remove common salt, e.g. sodium chloride, as discussed in the paragraph above. The use of nanofiltration membrane in combination with the mosaic membrane is not disclosed.

Hassan ('936) teaches softening sea water by nanofiltration and concentrating the concentrates in subsequent nanofiltration units (abstract, and Fig. 2). Hassan lacks the combination of NF membranes with mosaic membranes.

It would have been obvious to one skilled in the art at the time this invention was made to use nanofiltration membrane separation in the treatment of sea water as first step in the process as discussed reference '754 and Hassan, to soften the water by removing divalent ions from sea water, such as, sodium, calcium, and magnesium. The treated concentrate in a charged membrane is expected to concentrate divalent ions retained by the nanofiltration (NF) membrane in the first step, with production of diluted and concentrate solutions containing the divalent ions, and a minor amount of monovalent ions because the large percentage of monovalent ions pass through the NF membrane.

It would have been further obvious to one skilled in this art at the time this invention was made to combine the mosaic membrane of JP'122 and /or '887 to further concentrate sea water from the nanofiltration membrane, since the membrane is suggested for desalination, and further removal of common salt (sodium chloride), for higher monovalent salt recovery. In claim 12, different levels of concentration by each membrane are claimed. It would have been obvious to one skilled in this art at the time this invention was made to select a particular degree of concentration suitable to allow

performance of the second membrane, e.g. mosaic membrane. The skilled artisan can predict that excessive level of concentration can reduce the permeate flow in the nanofiltration membrane. The skilled in the art would have been motivated to produce salt solutions of distinct concentration, and /or produce a predetermined volume of softened water as desired.

Furthermore, combining two membrane units separating monovalent ions in a concentrate series is disclosed in Hassan; substituting the second nanofiltration membrane by a mosaic membrane, when common salt is to be recovered from sea water or from the concentrate of the first NF membrane would have been an obvious alternative, based on the prior art (discussed above) suggestion of using the mosaic membrane to recover common salt from sea water.

Regarding to the term “ocean deep water”, Hassan teaches “ocean water”, which applies to water at any depth in the ocean (or sea water in general).

Response to Arguments

2. Applicant's arguments filed 11/19/07 have been fully considered but they are not persuasive. Applicant argues that Davis, Hassan and additional prior art do not teach combining with mosaic membrane or the degree of concentration in each stage. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The combination of references as discussed above teach the alternative use of evaporation

reverse osmosis and mosaic membrane for salt and water purification from sea water, the skilled in the art knowing that reverse osmosis rejects monovalent ions would have been motivated to recover salts of monovalent ions from the RO concentrate, and can use mosaic membrane suggested for brine from sea water for that purpose. In the same way, brine from an evaporation stage when treated in a mosaic membrane can separate common salt from the brine, combination with nanofiltration is expected to produce a cumulative effect in monovalent separation, e.g. common salt (sodium chloride) when treating sea water. Selecting degrees of concentration that allow membrane permeation and suitable flux would have been obvious to the skilled in the art; process optimization to obtain a predetermined concentration is within the knowledge of the skilled artisan.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Article to Yamauchi et al also support the mosaic membrane use in sea water treatment.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ana M. Fortuna whose telephone number is (571) 272-1141. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Sample can be reached on (571) 272-1151. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ana M Fortuna/
Primary Examiner
Art Unit 1723

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Primary Examiner, Art Unit 1797

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